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(71) Applicant
Brunel University (United Kingdom),
Uxbridge, Middlesex UB8 3PH

(72) Inventors
Stefan Karp,
Stuart Clyde Burgess

(74) Agent and/or Address for Service
Reddie & Grose, 16 Theobalds Road, London WC1X 8PL

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(58) Field of search
F2C
Selected US specifications from IPC sub-class F16D

(54) One-way clutches

(57) A one-way clutch for use as a bicycle freewheel mechanism has an internally toothed ratchet wheel 7, which rotates with the chain driven wheel, and a hub 13 having a pair of diametrically opposed slots 14. A split moulded plastics ring 15 has one or more external ratchet teeth 18 to co-operate with the ratchet teeth 12 on the ring 7 and opposed lugs 17 engaged in the slots 14.

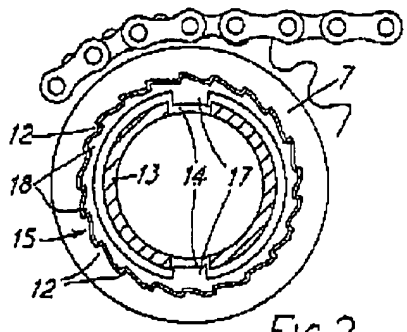

FIG.2

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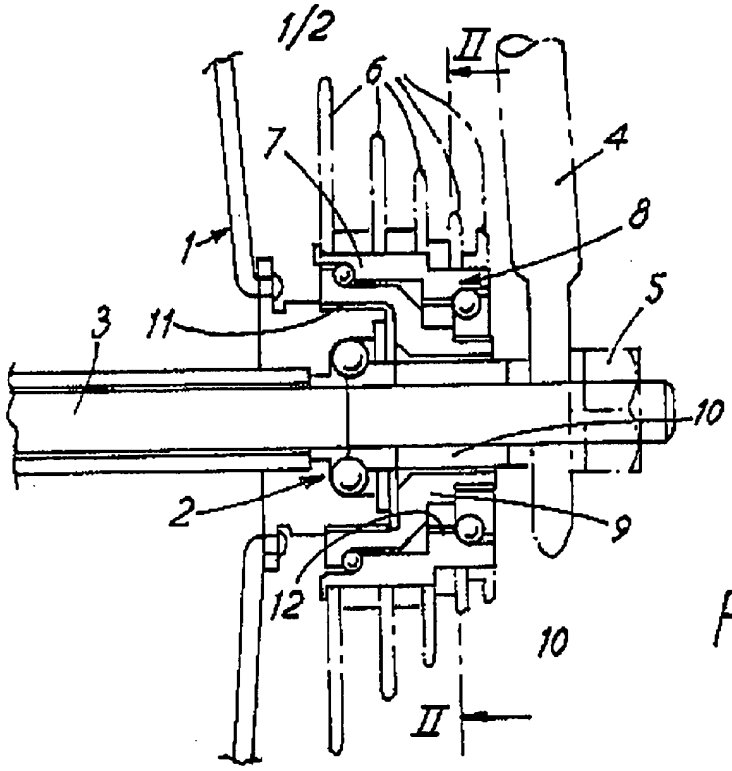

FIG.1

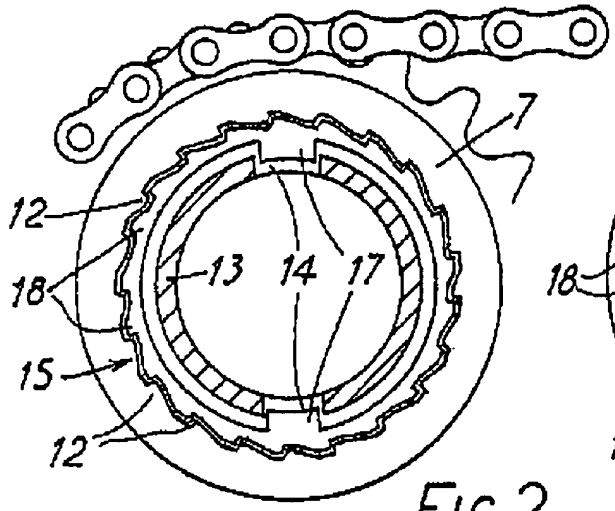

FIG.2

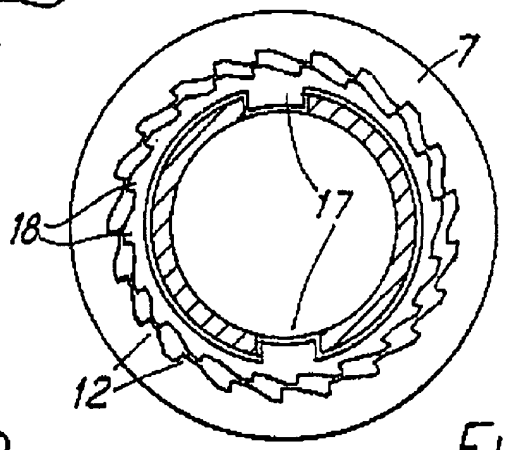

FIG.3

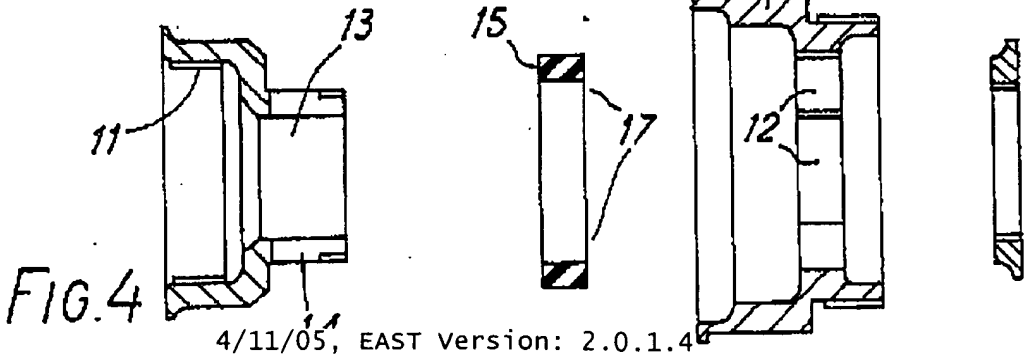

FIG.4

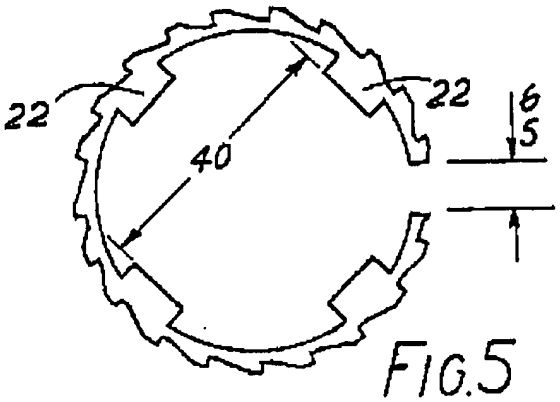

FIG.5

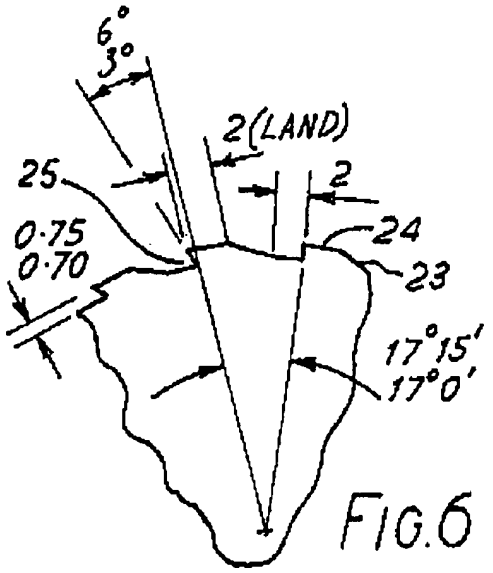

FIG.6

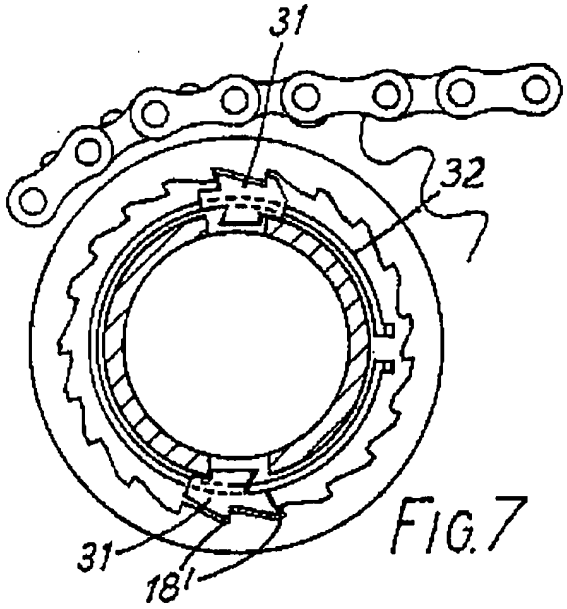

FIG.7

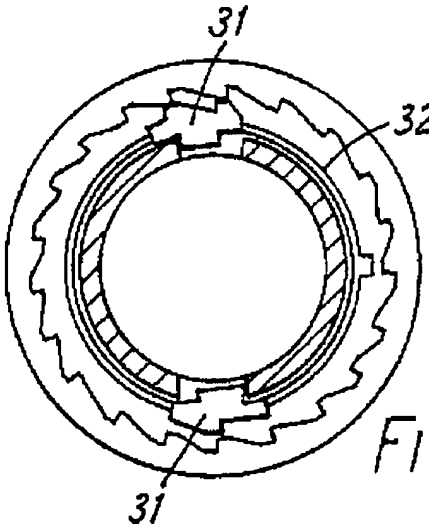

FIG.8

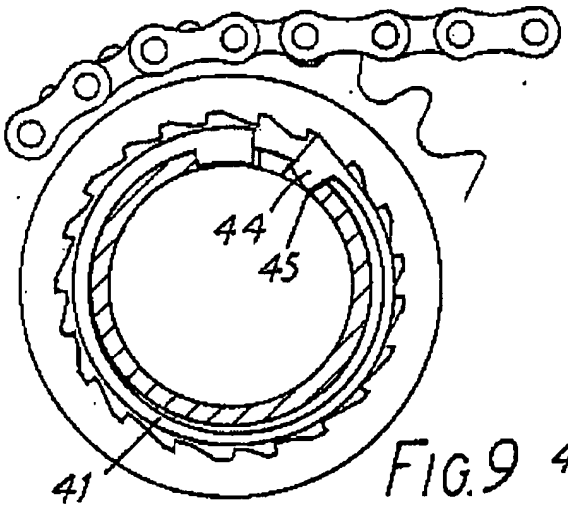

FIG.9

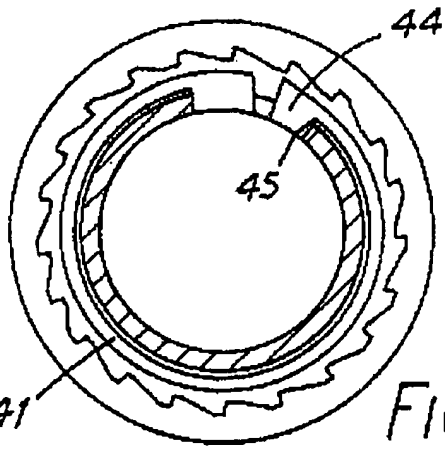

FIG.10

SPECIFICATION

One-way clutches

This invention relates to one way clutches, more particularly but not exclusively for use as bicycle freewheel mechanisms, comprising coaxial inner and outer sleeves, the outer sleeve being formed with an internal ratchet formation, while the inner sleeve carries at least one movable ratchet element cooperating with the internal ratchet formation in the outer sleeve.

The principal object of the invention, which is defined in the claims, is to reduce the cost of making and assembling such clutches, in particular by avoiding the need for complex milling operations on the inner sleeve.

Embodiments of the invention will now be described by way of example with reference to the drawings, in which :

Figure 1 is an axial sectional view of one end of the freewheel hub portion of a bicycle wheel;

Figure 2 is a cross section on the line II-II with the freewheel engaged and the pedals driving the wheel;

Figure 3 is a view similar to Figure 2 but under freewheeling conditions;

Figure 4 is an exploded axial sectional view of the components of the freewheel of Figures 1 to 3;

Figure 5 is an elevational view of a modified ratchet element;

Figure 6 shows part of Figure 5 on an enlarged scale;

Figures 7 and *8* are views corresponding to Figures 2 and 3 of a second embodiment, and

Figures 9 and *10* are similar views of a third embodiment.

The bicycle wheel hub construction shown in Figure 1 is generally of conventional construction in that the wheel 1 is mounted for rotation by means of a ball bearing assembly 2 on an axle 3 secured in the frame 4 of the bicycle by a clamping nut 5, this arrangement being repeated at the opposite end of the axle 3.

The wheel 1 can be driven in the forward direction of rotation by the cyclist through a change speed mechanism, in this case of the derailleur type in which the transmission chain, now shown, is transferable between a set of sprocket wheels 6 mounted on an outer sleeve member 7 of a free wheel mechanism 8 which also includes an inner sleeve member 9 which surrounds a spacer tube 10 (extending between the frame and the ball bearing assembly 2) and having large diameter internal screw threads 11 by which it is engaged on the screw threaded hub of the wheel 1.

As can be seen in Figures 2 and 3, the outer sleeve 7 is formed with a ring of internal ratchet teeth 12 while the axially aligned portion 13 of the inner sleeve 9 presents a smooth cylindrical external surface interrupted by a pair of diametrically opposed slots 14 in which a suitable tool may be engaged to tighten the inner sleeve 9 onto the hub of the wheel 1.

Interposed between the ring of ratchet teeth 12 of the outer sleeve 7 and the cylindrical portion 13 is a resiliently flexible ratchet element 15, for example, of adequately strong moulded plastics material in the form of an almost complete ring having a set of external ratchet teeth 18 corresponding to and engageable with the ratchet teeth 12, and having one circumferential gap 16 which, when closed by flexing of the ratchet element reduces the diameter thereof sufficiently to enable the teeth 18 to ride over the teeth 7. Further, the ratchet element 15 has a pair of diametrically opposed internal lugs 17 which engage in the slots 14 with sufficient circumferential clearance to permit the ratchet element 15 to contract completely out of engagement with the ratchet teeth 12, while preventing relative rotation between the ratchet element 15 and the inner sleeve.

In the driving condition shown in Figure 2, with the cyclist driving wheel 1 by means of the pedals and transmission, the latter rotates and outer sleeve 7 clockwise as seen in Figure 2. The ratchet teeth 12 pick up and drive the ratchet teeth 18 on the ratchet element 15 and thus rotate the latter which in turn drives the inner sleeve 13 and thereby the wheel 1 as a result of engagement of the lugs 17 with the side walls of the slots 14. Under freewheeling conditions, however, with the outer sleeve 7 stationary, continued clockwise rotation of the wheel 1 and the inner sleeve 9, the latter as the result of the engagement of the lugs 17 in the slots 14 and the consequent rotation of the ratchet element causes the latter to be deformed inwardly to the position shown in Figure 3 with its teeth 18 riding over the teeth 12. As soon as the cyclist resumes driving torque, the teeth 18 on the ratchet element will pick up with the teeth 12 on the outer sleeve and the ratchet element will expand to the configuration shown in Figure 2.

It will be noted that no special milling or other machining operations are necessary to ensure the proper seating and engagement of the ratchet element 15 with the portion 13 of the inner sleeve 9. Further as can be seen from Figure 4, assembly of the free wheel is particularly simple in that no loose springs or pawls have to be positioned and kept in position during other stages in the assembly operation. Although the slots 14 may need to be axially deeper than with conventional free wheels, their formation does not present any machining difficulty.

The ratcher element 21 shown in Figure 5 differs from that shown in Figures 1 to 4 in that it has two pairs of diametrically opposed lugs 22 and an increased number of ratchet teeth of correspondingly reduced radial height. Correspondingly, the inner sleeve will require four slots 14 distributed at 90 intervals and the outer sleeve will require an increased number of ratchet teeth again of reduce radial height. In this embodiment, the ratchet ring has 21 teeth. It may for example be made of acetal or epoxy resin. To improve the wear characteristics, each tooth may have a flat "land" 24 (Figure 6) in addition to its inclined ratcheting surface 23 and, to improve pick up and engagement on reversal of torque into the driving direction, each tooth may

have a small positive angle of rake for its driving face 25, for example of 3.

In the alterantive embodiment shown in Figures 7 and 8, the ratchet element 31 consists of a plurality of ratchets 31 each having the required tooth formation which are biased radially outwards into contact with the outer sleeve ratchet teeth by a circlip 32. In this case, each ratchet 31 is formed with two teeth 18' as well as a lug 17' and is formed with a slot on the opposite side to the teeth to receive the circlip.

In the further modification shown in Figures 9 and 10, the ratchet 41 is formed of resilient moulded plastics material and extends round the inner sleeve through slightly less than a complete revolution. At one end, the ratchet 41 has a lug 42 engaged in a slot 14. While the other end of the ratchet may simply be formed by an end face without substantial thickening of the section of the ratchet, it is preferred to mould this end with a ratchet head 43 which includes a further inwardly projecting lug 44 which can slide in a further slot 45 in the inner sleeve with clearance.

With this construction, when torque is to be transmitted from the outer sleeve 7 to the inner sleeve in the direction opposite to the freewheeling direction (with the outer sleeve 7 turning clockwise) one of the ring of ratchet teeth 12 will engage the ratchet head 43 and the latter will directly transmit the torque to the inner sleeve as the result of engagement of its lug 44 with the side of the slot 45.

During freewheeling, with the outer sleeve turning anticlockwise (Figure 10), the ratchet teeth 12 cam the ratchet head 44 further into the slot 45 against the resilience of the unthickened ratchet portion 41.

CLAIMS

1. A one-way clutch comprising a driven member having an externally toothed ratchet element biassed for engagement with a ring of internal ratchet teeth in a driving sleeve such that only forward torque can be transmitted from the driving sleeve to the driven member, wherein the driven member has an axially extending slot receiving a lug formed on the ratchet element.

2. A one-way clutch according to claim 1 wherein the ratchet element comprises a self-biassing resilient split ring formed with external ratchet teeth.

3. A one-way clutch according to claim 1 wherein the ratchet element is mounted on a resilient circlip to be thereby biassed into engagement with the ratchet teeth.

4. A one-way clutch according to claim 1 wherein the ratchet element comprises a resilient split ring having a ratchet head on the end remote from the lug engaged in the said slot.

5. A one-way clutch according to claim 4, wherein the ratchet head includes a further lug slidable in a further slot in the inner member.

6. A cycle freewheel clutch subject as described with reference to Figures 1 to 4, Figures 5 and 6, Figures 7 and 8 or Figures 9 and 10 of the drawings.

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